IN THE CLAIMS:

1. (Currently amended) An improved method which increases the operating range of a combustion burner that controls the ratio of flue gas to air in a flue gas-air oxidizer stream which method comprises:

A. contacting the combustion generator of the combustion burner with fuel and full excess air, recirculated flue gas, and combinations thereof with ~~wherein~~

B. modulating and controlling which results in: the modulation and control of the recirculated flue gas-air ratio is useful ~~to reduce~~ in

C. reducing the size of at least one fan in the recirculated flue gas line, one fan in the air line or combinations thereof; and

D. concurrently resulting ~~results~~ in reducing the power requirements of at least one fan and reduces the emission of nitrogen oxides.

2. (Currently amended) An improved method for operating gas, liquid or solid fuel combustion burners or combinations thereof that utilizes recirculated flue gas, full excess air and combinations thereof which method increases the operating range of the burner by operating from a high recirculated flue gas percentage at low heat input to a lower recirculated flue gas percentage at high heat input under conditions to minimize the change in oxidizer volumetric flow relative to change in the oxidizer mass flow, which method comprises:

a. contacting a combustion generator with a combustible fuel, wherein said combustion generator is located within a combustion chamber ;

b. utilizing an air inlet to provide full excess air to the combustion generator;

c. utilizing an exhaust stack for exhausting flue gas from the combustion chamber wherein said exhaust stack has a stack inlet coupled to the combustion chamber and a take-off point;

d. utilizing a recirculation inlet and a recirculation outlet for flue gas wherein said recirculation inlet is coupled to said take-off point;

e. combining in a mixing zone, recirculated flue gas, air, and combinations thereof for transport of recirculated flue gas and air through the burner;

f. contacting the combustion generator with fuel and recirculated flue gas and air mixtures, wherein the modulation control between the recirculated flue gas and excess air mixtures has flow control means for controlling the oxidizer flow between the recirculated flue gas and excess air ratio during operation to result in a mass of diluent which is provided to the said combustion chamber resulting in the reduced fan size of about 50% or less ~~of~~ reduction compared to the conventional fan and the operational electrical power needed for the at least one fan is reduced about 50% or less reduction of a comparable fan for a conventional combustion system.

3. (Original) The method of Claim 2 wherein in step e the mixing zone is selected from:

(i) a common fan having a flue gas inlet, an air inlet and an outlet to the combustion chamber;

(ii) a chamber having a flue gas recirculation line which contains at least one fan and a separate air line which contains at least one fan and an outlet line; or

(iii) an air line which includes at least one fan connected to the combustion chamber and a flue gas recirculation line which includes an optional fan having a fuel line immediately downstream of the optional fan which line exits to the combustion chamber.

4. (Currently amended) The method of Claim ~~1~~ 2 wherein in step f the control of the recirculated flue gas-air ratio utilizes an adjustable damper or an on-off damper in the flue gas recirculation line.

5. (Currently amended) The method of Claim ~~1~~ 2 wherein in step e the at least one fan is selected from the group consisting of constant speed, variable frequency drive and combinations thereof.

6. (Currently amended) The method of Claim ~~1~~ 2 wherein in step e the means for modulation control is selected from manual, electro-pneumatic, digital control or analog control.

7. (Currently amended) The method of Claim ~~1~~ 2 wherein in step e the means for modulation control is digital control modulation and the level of nitrogen oxides is less than about 20 ppm.

8. (Currently amended) The method of Claim ~~1~~ 2 wherein in step a the combustion generator uses gas, liquid or solid fuel.

9. (Currently amended) The method of Claim ~~1~~ 2 wherein in step a the combustion fuel is natural gas and in step e the means for modulation is digital control and the level of nitrogen oxides emitted is about 9 ppm or less.

10. (Currently amended) The method of Claim ~~1~~ 2 wherein in step e the means for control is selected from an adjustable damper, an on-off damper, a transfer fan, or combinations thereof, and the level of nitrogen oxides emitted is less than about 9 ppm.

11. (Original) The method of Claim 7 wherein in step (a) the fuel is natural gas, in step (c) a fan in each line is present as described in subpart (ii), and the modulation is digital control.

12. (Currently amended) An apparatus configuration for a gas, liquid or solid fuel combustion burner or combinations thereof, which apparatus configuration comprises:

a. a combustion generator;

b. an exhaust stack having a stack inlet;

c. a recirculation inlet and a recirculation outlet;

d. a separate air inlet to the combustion generator;

e. a mixing zone and

f. means within the flue gas recirculation line

for modulating and controlling the ratio of recirculated flue gas and excess air which results in a substantially constant volume flow and higher mass of air and flue gas diluent resulting in a reduced fan size and reduced operational electric power.

for modulating and controlling the ratio of recirculated flue gas and excess air which results in a substantially constant volume flow and higher mass of air and flue gas diluent resulting in a reduced fan size and reduced operational electric power.

~~An apparatus for a gas, liquid, or solid fuel combustion burner or combinations thereof that controls the ratio of flue gas to air in a recirculated flue gas-air oxidizer stream during operation which is useful to reduce the size of at least one fan in the flue gas recirculation line, air line or combinations thereof and reduce the power consumption of at least one fan in the flue gas line, air line or combinations thereof which concurrently increases the operating range of the apparatus.~~

13. (Currently amended) An apparatus for operating gas, liquid, or solid fuel combustion burners or combinations thereof that utilizes flue gas recirculation, excess air and combinations thereof which apparatus increases the operating range of the burner by operating from a high recirculated flue gas percentage at lower heat input to a lower recirculated flue gas percentage at high heat input under conditions to minimize the change in oxidizer volumetric flow relative to change in the oxidizer mass flow, which apparatus comprises:

A. a combustion generator located within a combustion chamber,

B. an exhaust stack for exhausting flue gas from the combustion chamber wherein said exhaust stack has a stack inlet coupled to said combustion generator and a take-off point,

C. a recirculation inlet and a recirculation outlet wherein for flue gas said recirculation inlet is coupled to said take-off point,

D. a separate air inlet to provide full excess air to said combustion generator,

E. a mixing zone for combining recirculated flue gas, air and combinations thereof for transport of recirculated flue gas and air through the burner; and

F. means within the flue gas recirculation line for modulation control between recirculated flue gas and excess air to result in a substantially constant higher

mass of air and flue gas diluent at a given fuel flow is provided to said combustion chamber which results in a reduced fan size of about 50% or less reduction and results in a reduction of operational electrical power of about 50% or less reduction than the conventional for the at least one fan needed for full excess air.

14. (Currently amended) The apparatus of Claim ~~11~~ 13 wherein in subpart F the means for control of the recirculated flue gas-air ratio is selected from an adjustable damper, an on-off damper, digital control or combinations thereof.

15. (Currently amended) The apparatus of Claim ~~11~~ 13 wherein in subpart F the at least one fan is selected from the group consisting of constant speed, variable frequency drive (VFD) and combinations thereof.

16. (Currently amended) The apparatus of Claim ~~11~~ 13 wherein in subpart F the means for modulationis selected from electro-pneumatic or digital control.

17. (Original) The apparatus of Claim 15 wherein in subpart F the means for modulation control is digital control and the level of nitrogen oxides is less than about 30 ppm.

18. (Currently amended) The apparatus of Claim ~~11~~ 13 wherein in subpart F the level of nitrogen oxides is less than about 9 ppm.

19. (Currently amended) The apparatus of Claim ~~11~~ 13 wherein in subpart A the combustion fuel is selected from gas, liquid or solid fuel.

20. (Original) The apparatus of Claim 15 wherein the combustion fuel is natural gas and the level of nitrogen oxides emitted is less than about 9 ppm.

21. (Currently amended) The apparatus of Claim ~~11~~ 13 wherein in subpart F the means for control of the flue gas-air ratio is selected from an adjustable damper, a transfer fan, or combinations thereof and the level of nitrogen oxides emitted is less than about 9 ppm.

22. (Currently amended) The apparatus of Claim ~~11~~ 13 wherein in subpart E the means for modulation control is E (iii), the fan is not present , and a high pressure fuel gas stream enters

the flue gas recirculation line that induces flow of flue gas and the combination exits to the combustion chamber.

23. (Currently amended) In a method for operating gas, liquid or solid fuel combustion burners that

utilizes flue gas recirculation, full excess air and combinations thereof which method increases the operating range of the burner by operating from a high flue gas recirculation percentage at lower heat input to a lower flue gas recirculation percentage at high heat input under conditions to minimize the change in oxidizer volumetric flow relative to change in the oxidizer mass flow, wherein the improvement comprises:

a. utilizing an adjustable damper or an on-off damper located within the flue gas recirculation line

b. utilizing ~~and~~ means for modulating said damper, and ~~the result is~~ which results in the fan size in the oxidizer gas lines ~~are~~ being reduced about 50% or less reduction as the operating power requirement is reduced about 50% or less reduction as compared to the conventional fan, or the level of nitrogen oxides emitted is reduced to a level of about 50 ppm or less.

APPLICANT'S INVENTION AND APPLICANT'S STATEMENT

Applicants' present invention is embodied in the presently amended claims. The independent claims were amended in a minor way for clarification.

Applicants assert for the record that any amendments made herein are not a waiver to the text and to the claims as originally filed.

Applicants are not estopped from filing subsequent continuation, continuation-in-part and/or divisional applications to seek appropriate claim coverage.

REJECTION OF CLAIMS 1, 4-10 AND 12 UNDER 35 USC § 112

Claims 1, 4-10, and 12 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regards as the invention.

The Examiner states that:

" - Claim 1 is merely a statement of desired result without setting forth positive steps in support thereof.

- Claim12 is merely a statement of function and/or desired results without setting forth positive structure in support thereof.

- In line 1 of claims 4-10, each of "1" should be changed to - 2 –.

- In line 1 of claims 14-16, 18-19, each of "11" should be changed to $-12_{(13)}-$."

Applicants respectfully traverse this rejection.

Applicants have as suggested by the Examiner amended the claims to be dependent on Claims 2 and 13 respectively. Independent Claim 12 is amended to set for specific apparatus configuration.

With these amendments and arguments, Applicants assert that these rejections have been overcome.

Reconsideration and withdrawal is respectfully requested.

REJECTION OF CLAIMS 1 AND 12 UNDER 35 USC § 102

Claims 1 and 12 are rejected under 35 U.S.C. 102(b) as being anticipated by W. Dreizler U.S. Patent 4,926,765, issued May 1990.

The Examiner argues that:

> "The method and apparatus as claimed is fully anticipated by Dreizler. In particular Dreizler shows in Fig. 1 an apparatus for a gas combustion burner that controls the ratio of fuel to air in a recirculated fuel gas-air oxidizer stream during operation."

Applicants respectfully traverse this rejection.

Applicants' present invention is summarized above and in the amended claims. Applicants have amended Claims 1 and 12 as suggested by the Examiner.

Applicants' argue that a careful reading of Dreizler '765 indicates that Applicants' present invention is not taught or suggested.

Therefore Applicants argue that this rejection has been overcome.

Reconsideration and withdrawal of this rejection is respectfully requested.

EXAMINER COMMENTS

The Examiner states that:

> "Claims 4-11 and 14-22 would be allowable if rewritten or amended to overcome the rejection(s) under 35 U.S.C. 112, second paragraph, set forth in this Office action. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Each of Rampley, Benz, Kubota, and Faulkner is cited to show a flue gas recirculation system for reducing nitrogen oxides.

RESPONSE: Applicants have rewritten and amended these claims. Therefore the rejections are overcome.

APPLICANTS' COMMENTS

Rampley et al. in U.S. 4,995,807 issued February 1991 discloses a flue gas recirculation system.

Berry et al. in U.S. 5,511,971 issued April 1996 discloses low NOX burner process for boilers.

Kubota in U.S. 6,039,560 issued March 2000 describes a low NOX boiler and method of controlling recirculations of exhaust gas.

Faulkner in U.S. 5,275,554 issued January 1994 discloses a combination system with a lower NOX adaptor assembly.

Applicants assert that these references individually or when combined in any fashion do not teach or suggest Applicants' present invention as presently amended.

SUMMARY

Applicants argue that with consideration the above amendments and remarks that the present claims are of a form and scope for allowance. Prompt notification thereof is respectfully requested.

If the Examiner has any questions, he is instructed to call the undersigned attorney of record at 650-324-1677 x103 as soon as possible.

If additional fees are required for the filing of these documents, the Commissioner of hereby authorized to charge or credit an overpayment to Deposit Account No. 16-1331.

Respectfully submitted,

Date: March 16, 2004

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